

Durham Research Online

Deposited in DRO:

13 October 2016

Version of attached file:

Accepted Version

Peer-review status of attached file:

Peer-reviewed

Citation for published item:

Evanschitzky, H. and Iyer, G. R. and Pillai, K. G. and Kenning, P. and Schütte, R. (2015) 'Consumer trial, continuous use, and economic benefits of a retail service innovation : the case of the personal shopping assistant.', *Journal of product innovation management.*, 32 (3). pp. 459-475.

Further information on publisher's website:

<https://doi.org/10.1111/jpim.12241>

Publisher's copyright statement:

This is the accepted version of the following article: Evanschitzky, H., Iyer, G. R., Pillai, K. G., Kenning, P. and Schütte, R. (2015), Consumer Trial, Continuous Use, and Economic Benefits of a Retail Service Innovation: The Case of the Personal Shopping Assistant. *Journal of Product Innovation Management*, 32(3): 459-475, which has been published in final form at <https://doi.org/10.1111/jpim.12241>. This article may be used for non-commercial purposes in accordance With Wiley Terms and Conditions for self-archiving.

Additional information:

Use policy

The full-text may be used and/or reproduced, and given to third parties in any format or medium, without prior permission or charge, for personal research or study, educational, or not-for-profit purposes provided that:

- a full bibliographic reference is made to the original source
- a [link](#) is made to the metadata record in DRO
- the full-text is not changed in any way

The full-text must not be sold in any format or medium without the formal permission of the copyright holders.

Please consult the [full DRO policy](#) for further details.

**CONSUMER TRIAL, CONTINUOUS USE, AND ECONOMIC BENEFITS OF A
RETAIL SERVICE INNOVATION:
THE CASE OF THE PERSONAL SHOPPING ASSISTANT¹**

Heiner Evanschitzky*

Gopalkrishnan R. Iyer

Kishore Gopalakrishna Pillai

Peter Kenning

Reinhard Schütte

Published in:

Journal of Product Innovation Management, 32 (3), 2015, 459-475

* corresponding author

¹ Previously titled as: "Service Innovations in Retailing: Consumer Trial, Continuous Usage, and Economic Benefits."

ACKNOWLEDGEMENTS

The authors acknowledge the help of Roger Calantone, Rajesh Chandy, Roya Gholami, Erik A. Mooi, A. Parsuraman, and Florian von Wangenheim who commented on earlier versions of this manuscript.

ABSTRACT

CONSUMER TRIAL, CONTINUOUS USE, AND ECONOMIC BENEFITS OF A RETAIL SERVICE INNOVATION: THE CASE OF THE PERSONAL SHOPPING ASSISTANT

Service innovations in retailing have the potential to benefit consumers as well as retailers. This research models key factors associated with the trial and continuous use of a specific self-service technology (SST), the personal shopping assistant (PSA), and estimates retailer benefits from implementing that innovation. Based on theoretical insights from prior SST studies, diffusion of innovation literature, and the technology acceptance model (TAM), this study develops specific hypotheses and tests them on a sample of 104 actual users of the PSA and 345 non-users who shopped at the retail store offering the PSA device. Results indicate that factors affecting initial trial are different from those affecting continuous use. More specifically, consumers' trust towards the retailer, novelty seeking, and market mavenism are positively related to trial, while technology anxiety hinders the likelihood of trying the PSA. Perceived ease of use of the device positively impacts continuous use while consumers' need for interaction in shopping environments reduces the likelihood of continuous use. Importantly, there is evidence on retailer benefits from introducing the innovation since consumers using the PSA tend to spend more during each shopping trip. However, given the high costs of technology, the payback period for recovery of investments in innovation depends largely upon continued use of the innovation by consumers. Important implications are provided for retailers considering investments in new in-store service innovations.

Keywords

service innovation; self-service technology; trial and adoption; retailer benefits; personal shopping assistant.

EXTENDED ABSTRACT

CONSUMER TRIAL, CONTINUOUS USE, AND ECONOMIC BENEFITS OF A RETAIL SERVICE INNOVATION: THE CASE OF THE PERSONAL SHOPPING ASSISTANT

Incorporation of technology within physical stores affords opportunities for the retailer to reduce costs, while enhancing service provided to consumers. Therefore, service innovations in retailing have the potential to benefit consumers as well as retailers. This research models key factors associated with the trial and continuous use of a specific self-service technology (SST) in the retail context, the personal shopping assistant (PSA), and estimates retailer benefits from implementing that innovation. In so doing, the study contributes to the nascent area of research on SSTs in the retail sector. Based on theoretical insights from prior SST studies, diffusion of innovation literature, and the technology acceptance model (TAM), this study develops specific hypotheses regarding the (a) antecedent effects of technological anxiety, novelty seeking, market mavenism, and trust in the retailer on trial of the service innovation, (b) the effects of ease of use, perceived waiting time and need for interaction on continuous use of the innovation, and (c) the effect of use of innovation on consumer spending at the store. The hypotheses were tested on a sample of 104 actual users of the PSA and 345 non-users who shopped at the retail store offering the PSA device, one of the early adopters of PSA in Germany. Data were analyzed using logistic regression (antecedents of trial), multiple regression (antecedents of continuous use), and propensity score matching (assessing retailer benefits). Results indicate that factors affecting initial trial are different from those affecting continuous use. More specifically, consumers' trust towards the retailer, novelty seeking, and market mavenism are positively related to trial, while technology anxiety hinders the likelihood of trying the PSA. Perceived ease of use of the device positively impacts continuous use while consumers' need for interaction in shopping environments reduces the likelihood of continuous use. Importantly, there is evidence on retailer benefits from introducing the innovation since consumers using the PSA tend to spend more during each shopping trip. However, given the high costs of technology, the payback period for recovery of investments in innovation depends largely upon continued use of the innovation by consumers. Important implications are provided for retailers considering investments in new in-store service innovations. The study contributes to the literature through its (a) simultaneous examination of antecedents of trial and continuous usage of a specific SST, (b) the demonstration of economic benefits of SST introduction for the retailer and (c) contribution to the stream of research on service innovation, as against product innovation.

Conventional brick-and-mortar retailers have been facing a variety of challenges in recent years, including competition from pure-play Internet retailers, issues in attracting traffic to their stores and declining margins (Economist 2009). Some have been successful in creating their own websites and pursue multi-channel strategies (Noble et al. 2009), while others have attempted to create information-rich experiences for consumers within their physical retail stores (Sethuraman and Parasuraman 2005). A challenge, especially in developed Western economies, has been the rise in costs of labor for staffing and providing better service within physical outlets. One solution that has emerged in recent times is the incorporation of technology within physical store outlets. Such technologies are deployed to not only enhance service-levels while lowering labor and other operational costs, but also provide better convenience and shopping experience to consumers (Berry et al. 2002; Grewal et al. 2009). Examples of such self-service technology (SST) deployment include the use of in-store kiosks for information and ordering, self-checkouts, and electronic personal shopping assistants (PSA).

Store-front retailers are increasingly realizing that consumer experience management is important not only for enhancing satisfaction and performance (Puccinelli et al. 2009), but also for providing a unique and hedonistic experience that shoppers may not be able to obtain with e-tailers. However, technological innovations aimed at enhancing service levels are complicated since successful implementation and realized benefits of such technologies depend upon consumer trial and willingness to use continuously (Meuter et al. 2005; Sethuraman and Parasuraman 2005; Weijters et al. 2007). A vast range of technologies have been the focus of academic research in the past decade under the rubric of “self-service technologies” (Dabholkar and Bagozzi 2002; Meuter et al. 2000; Meuter et al. 2005). While factors affecting consumers’ continuous use of such technologies have been the primary focus of prior research, there is

scarce evidence on the use of such technologies within a retail store. In addition, there is little research on whether technological innovations in services yield financial benefits to the provider.

The focus of this research is on a specific retail innovation, the electronic personal shopping assistant (PSA). The PSA is a hand-held or shopping cart-mounted device that provides in-store information and check-out services for consumers. The device creates not only an information-rich shopping environment but is also aimed at providing added convenience to consumers without deploying costly labor for pre-sales information and check-out services (Bedington 2002; Pemberton 2004).

This research on the PSA reveals some interesting characteristics of retail service innovations, including various factors that contribute to consumer trial and continued use. Moreover, tracking consumers' continued use enables an estimation of whether the technology roll-out would provide added benefits for the retailer. Thus, in a sharp contrast to prior studies on consumer adoption of (retail) service innovations, this research presents the perceived consumer benefits along with estimated provider benefits of continued use of technology. Keeping in mind the case-nature of this research (i.e., the application to the trial and use of the PSA), the following three contributions are sought:

1. This research examines antecedents of both trial and continuous use of the PSA, allowing an assessment of whether these drivers are different. Since trial is a logical prior to repeat use (Rogers 2003), results would help managers develop more effective strategies to stimulate trial and other distinct strategies to encourage continuous use.
2. This study goes beyond previous research by investigating the economic benefits for the retailer introducing the service innovation, in this case, the PSA. Since service innovations

suffer high rates of failure (van Riel et al. 2004), the analysis allows for a more realistic assessment of the likely long-term innovation success of the PSA.

3. This article echoes the sentiments of scholars within the area of innovation, who call for greater attention to service innovation as being distinct from product innovation (e.g., Barczak 2012; Schleimer and Shulman 2011; Wooder and Baker 2011). Even though this study is on one specific service innovation, results add to the growing corpus of research that suggests that service innovations need to be examined differently from product innovations.

The remainder of the article is organized as follows. First, key findings from a systematic literature review on SSTs are summarized. Then, a conceptual model is developed from prior SST studies, diffusion of innovation literature, and research on the technology acceptance model (TAM). This model is then tested using a sample of actual consumers. Results indicate that trust towards the retailer, novelty seeking, and market mavenism are positively related to trial, while technology anxiety hinders it. Perceived ease of use positively impacts continuous use while need for interaction in shopping environments discourages it. Further, results show that retailers can benefit from consumer use of the PSA since such consumers tend to spend more during each shopping trip. The article concludes with academic implications as well as recommendations for retailers.

LITERATURE REVIEW

There has been considerable research in recent years on the trial and adoption of self-service technologies (Curran and Meuter 2005; Meuter et al. 2003; Meuter et al. 2005; Weijters et al. 2007). Following Dabholkar (1996), several studies have examined self-service technologies (SSTs) in a variety of B2C as well as B2B contexts (e.g., Bhappu and Schultze 2006; Meuter et

al. 2000; Wang 2012). An examination of 137 articles on SSTs published during the period 1996-2012 revealed that researchers have typically focused on identifying attitudinal, behavioral, and demographic factors that could potentially affect consumer trial, repeated use and adoption of specific SSTs.

Among the factors contributing to adoption of SSTs, past research reveals that benefits derived from use were very important for consumers (e.g., Meuter et al. 2000; Weijters et al. 2007) while their anxiety about the technology limited adoption (e.g., Meuter et al. 2003). Literature has uncovered several innovation characteristics (e.g., relative advantage) as well as individual factors (e.g., demographics) that contribute to initial trial of SSTs (Meuter et al. 2005; Rogers 2003). Researchers have also argued that continued use deserves explicit focus on factors such as their acceptance and satisfaction with the technology (Eriksson and Nilsson 2007).

Only a few prior studies have focused on SSTs in the retail store context, including technologies such as self-checkouts and multimedia kiosks (e.g., Jia et al. 2012; Wang 2012; Wang et al. 2012; Weijters et al. 2007; Westjohn et al. 2009). PSA, an emerging technology that is expected to have wider penetration in the coming years, has been the focus of only two studies. Jia et al. (2012) use a scenario based method among students who have never used the technology, while Weijters et al. (2007) examine the PSA in an actual use context.

In the context of extant literature, this study stands out in several important ways. First, it models consumer trial distinctly from continued use. Prior research has maintained that factors contributing to trial are distinct from those contributing to adoption and that trial does not necessarily lead to continued use (Liljander et al. 2006; Meuter et al. 2005). However, most prior studies on SSTs focus exclusively either on trial or adoption of SSTs. In contrast, this study

models both trial and continued use and explicitly models their different antecedents (Dabholkar and Bagozzi 2002; Weijters et al. 2007).

Second, this research extends the literature on SST trial and continued use through the examination of relevant, yet largely overlooked constructs. For example, novelty seeking, though pertinent to SST trial, has not attracted much attention (for an exception, see Dabholkar and Bagozzi 2002). Similarly, while market mavenism has been proposed as important for understanding consumers who are the first to try out innovations (Clark and Goldsmith 2005; Feick and Price 1987), this construct has not received explicit focus in the study of SSTs.

Third, a salient contribution of this research is the examination of benefits to the provider from introducing a retail service innovation. At the time this study was conducted, the PSA was new to the firm and new to the market. In such cases, innovation success can be measured by consumer acceptance, satisfaction, net profit goal, IRR/ROI, and competitive advantage (Griffin and Page, 1996). While some prior research has examined the relationship between SST investments and financial performance (e.g., Hung et al. 2012), research has not examined whether SST investments payoff based on consumers' continued use. Thus, the returns to the firm rolling out the technology have not been specifically assessed in prior research.

In summary, this study adds to the literature in several ways. It contributes to the study of SSTs in the retail context. Unlike previous research, it examines antecedents of trial and continuous use concurrently and in an actual usage context. It examines constructs that are new to the SST context or have attracted only scarce research attention. Importantly, this is the first study to examine the financial implications of SST introduction for the provider in a retail setting.

CONCEPTUAL MODEL AND HYPOTHESES

Theoretical Underpinning

This study sets out to empirically test factors that contribute to consumer trial and continuous use of a specific retail service innovation, the PSA, and assess whether introducing the PSA is beneficial for the provider. Key insights from the SST literature and the diffusion of innovation literature (e.g., Rogers 2003) are used to argue why specific consumer characteristics would determine the likelihood of initial trial. Also, the technology acceptance model (TAM) (Davis 1989) suggests that consumers may engage in cost-benefit assessments and such evaluations would determine whether an innovation will be used on an ongoing basis. Thus, while initial trial of an innovation could be explained through recourse to the diffusion of innovations model (Rogers 2003), TAM suggests factors that would be relevant for repeat use. The conceptual model, as charted in Figure 1, therefore links retailer initiative in introducing the service innovation to likely consumer responses of trial contingent upon their specific attitudes and traits. Continuous use is driven by consumers' evaluations of costs and benefits of the innovation, which, in turn, would translate to potential retailer benefits. The key hypotheses linking consumer trial, continuous use, and retailer benefits are further detailed below.

---Figure 1 about here---

Antecedents of Initial Trial of the Service Innovation

Prior experience with retail service innovations, such as a shopping cart affixed pervasive computing application, have shown that consumers need to get past their initial skepticism to understand the value provided by technology (Kourouthanassis and Roussos 2003). The theory of planned behavior (Ajzen 1991) suggests that specific attitudinal constructs would influence initial trial, apart from other consumer characteristics (Curran and Meuter 2007; Feick and Price

1987). Prior literature identifies four important antecedents, including: (a) technological anxiety, since the focus is on a technological innovation, (b) novelty seeking, since the purpose is to examine *initial* trial, (c) market mavenism as a retailing context specific motivator of innovative consumer behavior, and (d) consumer trust towards the retailer, since prior research has recorded the role of trust as a driver of retailing behavior.

Technology Anxiety: Innovation research suggests that initial trial of an innovation is rarely a neutral process and that consumers can experience strong emotions before initial use (Wood and Moreau 2006). One of these emotions is anxiety (Meuter et al. 2003). Technology anxiety in consumers leads to reluctance to try the technology, while conversely, it has been suggested that technological readiness is important for consumer trial of new technologies (Parasuraman 2000).

In the case of SSTs, Liljander et al. (2006) find that technological readiness has a positive effect on consumer attitudes toward using airline self-check-in. Similarly, technology anxiety has been found to be related to consumer disregard of SSTs. For example, Meuter et al. (2003) report that respondents with higher levels of technology anxiety use fewer SSTs. Oyedele and Simpson (2007) also found that technology anxiety negatively affects SST trial. Therefore:

H₁: Technology anxiety negatively affects consumer trial of the service innovation.

Novelty-Seeking: Some consumers consciously choose situations that are novel. In the context of shopping, these novelty-seeking consumers seek out new information from a variety of sources, seek variety in consumption, try out new products, and pursue new stimuli, which could be in the form of information, products, or technologies (Hirschman 1980).

In the context of SSTs as well, it has been argued that consumers who are inherently novelty seekers would be more likely to have a positive outlook on technology and technological

products, and that they would be more likely to enjoy the technological solution in solving ‘old’ problems (Dabholkar and Bagozzi 2002). Consumers may be willing to try out the new technology for fun or pleasure (Curran and Meuter 2007). It is quite possible that consumers who first try out a service innovation are novelty seekers, especially given the fact that such consumers would want to try out a new technology without making too many inferences or judgments about expected ongoing benefits of such technology (Dabholkar and Bagozzi 2002).

H₂: Consumers’ novelty-seeking positively affects trial of the service innovation.

Market Mavens: Market mavens are consumers who see themselves as ‘expert shoppers’ with knowledge and influence across a broad range of product categories (Feick and Price 1987). They are more aware of new products and are attentive to new technologies. Also, they demonstrate higher levels of interest in shopping compared to other consumers and are more responsive to promotions and marketing communications (Clark and Goldsmith 2005). Since market mavens also like to lead the market when trying out innovative solutions and are passing on information pertaining to innovations, they are quite motivated to try out innovations, such as a SST. Recent research has confirmed this reasoning and shown that market mavens exhibit a positive affinity toward technology (Geissler and Edison 2005). Therefore, it can be expected that market mavens would be among the first to use the service innovation. Hence:

H₃: Consumers’ market mavenism positively affects trial of the service innovation.

Trust in the Retailer: While trust has been shown to be an extremely important factor in consumer use of Internet retailing, it is surprising that the SST literature has thus far neglected the explicit consideration of trust in the retailer as a factor in technology use. However, in other

contexts, research has shown that the attitude toward retail websites is strongly impacted by trust (Donthu 2001). Similarly, both online shopping and intent to purchase online have been shown to be influenced by trust (Jarvenpaa and Todd 1997). Consumer evaluations of e-service quality, as well as satisfaction with the transaction, are also affected by trust (Evanschitzky et al. 2004).

Several of the SSTs studied in prior research (Curran et al. 2003; Curran and Meuter 2005; Eriksson and Nilsson 2007; Liljander et al. 2006; Meuter et al. 2005) relied on electronic interfaces. Consumers exposed to new electronic technologies often lack complete information about the capabilities of the technologies and use of the data, and therefore, may be concerned about the security of transactions and the use of personal information. They might fear that personal information collected when using the technology might be exploited by the retailer. Thus, they may have to make a “leap of faith” when using such technologies. This leap of faith can be characterized as trust (Bahmanziari et al. 2003) and often, consumer concerns need to be mitigated through appropriate trust-building measures. Consumers’ perceived costs of loss of privacy and security are reduced if the consumer trusts the retailer not to retrieve and use any stored information in a manner that compromises their privacy and security. Therefore:

H₄: Trust in the retailer positively affects trial of the service innovation.

Antecedents of Continuous Use of the Service Innovation

The enhancement of shopping experience through the use of service innovations would likely convert consumers into repeat users of the technology and the retail store. Though trial is motivated by novelty or perceived benefits, it is possible that these may eventually wear off. In order for a new technology to effect sustained behavioral change, that technology must offer ongoing benefits and the consumer must enjoy interacting with the technology. If retailers are

able to convert initial trial into continuous use, they would benefit from economies of scale in technology implementation. Moreover, continuous use of the technological innovation may result in additional sales and also enable the retailer to position on the basis of a unique store atmosphere and enhanced in-store experience.

As highlighted by TAM, a key factor that will influence post-trial acceptance of the technology is perceived ease of use. In addition, consumers would assess the cost and benefits of using the technology after the initial novelty has passed. Also, following recent research, an important benefit of technology use – perceived reduction in waiting time –, and an important cost – loss of personal interaction (Wang et al. 2007; Weijters et al. 2007) are assessed.

Ease of Use: According to TAM, perceived ease of use strongly influences the adoption of a new technology while lowering its perceived efforts. Perceived ease of use directly affects the perceived effort needed to use the technology, because such perceptions are derived from the belief that the use of a particular technology is free of effort (Davis 1989; Davis et al. 1989). Similarly, equity theory (Adams 1963) suggests that the motivation of people to try new things depends on their gain/effort ratio. If the expected efforts are (over)compensated by the expected gains, this should motivate people to keep on using the new technology. In the context of SSTs as well, several empirical studies have found a significant effect of perceived ease of use on the continuous use of the SST (Curran and Meuter 2005; Weijters et al. 2007). Hence:

H₅: Consumers' perception of ease of use positively affects continuous use of the service innovation.

Perceived Waiting Time: In retail services industries, perceived waiting time at check-out counter is a key factor in consumer satisfaction evaluations (Dabholkar and Bagozzi 2002).

Several SSTs, such as automated check-in/out at a hotel and rental car services, as well self-scanning in retail stores, offer the primary advantage of reducing waiting time for consumers. In a recent empirical study, Weijters et al. (2007) provide evidence for positive correlation between perceived usefulness (e.g., reduced perceived waiting time) of a certain SST (i.e., self-scanning) and adoption of that SST in a retail setting. Some service innovations, such as computerized shopping carts and self-scanning technologies, are designed to help reduce waiting times. Consumers desiring reduced waiting times would view such innovations as providing a major benefit and would be more likely to use it on a regular basis. Therefore:

H₆: Consumers' perceived reduction in waiting time positively affects continuous use of the service innovation.

Need for Interaction: According to Dabholkar and Bagozzi (2002, p. 188), the need for interaction with a service employee can be defined “as the importance of human interaction to the consumer in service encounters.” For many consumers, the process of shopping is not merely a business transaction, but provides social benefits as well, such as interactions with sales people, information gathering, and contact with other consumers (Dabholkar 1996; Wang et al. 2007). SSTs, however, reduce such interactions and contacts with other people. For a service innovation that essentially entails replacement of labor with technology, the corresponding reduction in social interactions may be perceived as a disadvantage by those who seek human contact during shopping. While this disadvantage might not be accounted for in the trial decision, as it is a one-off episode, it should certainly play a role in the decision to continue usage. Hence:

H₇: Consumers' need for interaction negatively affects continuous use of the service innovation.

Retailer Benefits

The above discussion suggests that if consumers perceive the net benefits from using a service innovation to be positive, they will likely try and continuously use that innovation. A service enhancing technology has the potential to reduce consumer perceptions of shopping as work and enhance the fun side of shopping (Curran et al. 2003). It has been shown that affect is a very important dimension of consumers' shopping experience (Donovan and Rossiter 1982). Researchers have recognized that consumer perceptions of shopping value are shaped by the two primary dimensions of shopping as work and/or fun (Babin et al. 1994). Consumers' perceived advantage from using the service innovation would likely result in lowering the perception of shopping as work and enhancing their enjoyment of shopping trips to the store as well as making the store as a preferred one among competing alternatives.

Research, especially on use of online websites and Internet shopping has shown that a favorable experience is crucial to consumers' shopping behavior and patronage intentions (Childers et al. 2001). Research on the use of "avatars," or lifelike interactive characters on websites reveals that the enhanced shopping experience could not only lower inhibitors to online shopping but also enhance patronage intentions (Wang et al. 2007). These findings can also be extended to technology-led offline innovations, especially in-store service innovations.

Moreover, with a technology-enabled service innovation, retailers could provide more information to consumers on their assortment and also information on complementary products. Thus, retailers could gain from the significant cross- and up-selling opportunities. The consequent increase in consumer purchases is thus a clear benefit for the retailer. Prior

experience with service innovations has shown that the average transaction values for consumers using the innovation were significantly higher than for regular shoppers (Pemberton 2004):

H₈: Consumers using the service innovation will spend more at the retail store.

METHODOLOGY

Context

The preceding hypotheses were tested in the context of a specific service innovation – the personal shopping assistant, or PSA –, which is a small tablet computer that can be attached to a shopping cart. It can be conceived of as a practical implementation of a “computerized” shopping cart. PSAs based on sophisticated technologies accommodate wireless communication in real time, store and retrieve the shopper’s personal shopping history, provide information on locations of all products/categories within the store, provide information on related or complementary products, and allow self-scanning by the consumer (Bedington 2002; Pemberton 2004). The PSA is designed to be used at the point-of-sale, which in most practical contexts is the retail store. Some versions of the PSA can provide detailed information on products without having to wait for a salesperson, answer queries, provide information on promotions within the maze of a large retail store and also enable the consumer to check-out without having to wait in line (Bedington 2002). The result is a more personalized and convenient shopping experience for the consumer and from the point of view of the retailer, lower labor costs of providing individualized service.

However, even though the PSA provides benefits to consumers (e.g., offering additional services) which might translate into benefits to the retailer (e.g., higher spending per visit), retailers have been cautious in their adoption of the technology. One reason for the hesitancy

could be the additional capital costs involved in hardware and software; another could be the added costs of motivating consumers to try and continuously use the new technology.

Sethuraman and Parasuraman (2005), for instance, argued that initial introductions of computerized shopping carts failed not only due to technological problems and high costs, but also due to consumers' lack of response. They called for further research on understanding consumer reactions to this technology, "especially in terms of their perceived costs and benefits" (p. 111). Moreover, they suggested that research should include the retailer's perspective as well, especially in terms of understanding the context in which such technology is most beneficial as well as the cost effectiveness of such computerized shopping carts.

Data Collection

Because PSA as a technology is not widespread at the current stage, this study obtained the cooperation of one of the early retail adopters of PSA in Germany. The retail store that agreed to cooperate is a large retail supermarket chain in Germany that had one pilot store offering the PSA device to shoppers.

Trained interviewers intercepted shoppers at the desk where they would normally pick up the PSA device. Thus, the interviewers intercepted shoppers only after they picked up the device; therefore, they had no influence on the consumers' decision to use the PSA. After that, consumers were asked if they would like to participate in an academic study on their shopping experience. It was pointed out that their answers would have no impact on any actions taken by the retailer and all information would be treated with the greatest confidentiality. A total of 104 shoppers who picked up the PSA device agreed to participate in this study and to voluntarily reveal their loyalty card identity. From the introduction of the PSA device at the store to the time of the study, a total of 500 consumers used the device. Thus, the sample represents 20.8% of all

users of the device. To compare the set of users with non-users, a random sample of 345 non-users of the PSA was obtained by intercepting shoppers after they entered the store.

Measures

Measures for consumer factors affecting PSA use were adapted from prior research. Technology anxiety was measured with six items from Meuter et al. (2003), originating from a scale on computer anxiety initially developed by Raub (1981). The market maven scale was obtained from Feick and Price (1987). Similar to Dabholkar and Bagozzi (2002), the scale for novelty seeking was obtained from the “need of change” factor in Mehrabian and Russell’s (1974) arousal seeking scale. Trust was measured using the scale developed by Chaudhuri and Holbrook (2001). Need for interaction was measured using three items developed by Dabholkar (1996) and used as well in Dabholkar and Bagozzi (2002). Ease of use was measured using three items obtained from Dabholkar (1996). Similar to Dabholkar (1996) and Weijters et al. (2007), perceived waiting time was measured using a single question. All these scales, except for ease of use, were measured on a seven-point Likert-type scale, with 1 being “totally disagree” and 7 being “totally agree.” Ease of use was measured using a seven-point semantic differential scale.

A back translation approach was employed to ensure that the adapted measurement scales in the German language questionnaire retained their original meanings. Executives at the store, whose cooperation was vital to data collection, also provided insights on the questionnaire. Purchase data for shoppers who used the PSA was obtained from their loyalty card transactions data. This was needed to assess retailer benefits from PSA use. For the PSA users, continuous use of the PSA was also assessed by measuring the percentage of shopping trips during which they used the PSA device. For those consumers who did not use the PSA, information on the total amount spent during the visit (when the study was conducted) was obtained by collecting

their receipt after their shopping trip. Thus, for both users and non-users, objective data on purchases were obtained.

RESULTS

Descriptive Results and Measurement Properties

The demographic characteristics of both the PSA user and the non-user sample are summarized in Table 1, which indicates that PSA users tend to be male, are somewhat younger, and tend to have a higher income as compared to non-users.

---Table 1 about here---

Confirmatory factor analysis was used to assess factor loadings and reliabilities. Table 2 provides items used in each scale, Alpha values, composite reliability (CR), and average variance extracted (AVE). The Alpha values of all scales are above the recommended threshold of .7 (Nunnally 1978). All values of CR meet the criteria proposed by Hair et al. (2006) and, hence, convergent validity is indicated. Discriminant validity of the constructs was also assessed and found to be indicative using the procedure proposed by Fornell and Larcker (1981) (Table 3).

---Table 2 & 3 about here---

Assessing Antecedents of Initial Trial of the PSA

Logistic regression on a dichotomous dependent variable (PSA user/non-user) was used to analyze the impact of consumer attitudes and traits on PSA trial. The predicted values are probabilities and the predicted proportion of PSA users is expressed as the logistic model $\frac{\exp(X)}{1+\exp(X)}$, where X is a linear function of the hypothesized independent variables. The results are shown in Table 4.

---Table 4 about here---

The overall model predicting initial PSA use has a good fit, as indicated by the change in the -2 log likelihood from the baseline model (less than .001). The Cox & Snell R-square and Nagelkerke R-square are acceptable given the nature of the study and the fact that practical significance may be elusive at this early stage of research. Further, the Hosmer and Lemeshow measure of overall fit, as indicated by the Chi-square test of the difference between observed and predicted classification, is non-significant. Therefore, the overall model fit seems acceptable. To test for model stability, a random split of the sample was performed; key results remained almost unchanged, with some of the significance levels slightly dropping.

Table 4 shows the results for the tests of factors affecting initial PSA trial (H_1 - H_4) and all four hypotheses find support. In particular, this research finds as expected, a negative impact of technology anxiety on PSA use confirming that higher technology anxiety would lower consumer's affinity to the PSA. In other words, those with low technology anxiety are more likely to initially try the PSA. Calculating the odds-ratio ($Exp(Beta)$), it can be noted that a one unit decrease in anxiety would increase the likelihood of being a PSA user by .725.

In line with earlier studies on SSTs, this study had hypothesized in H_2 that novelty seeking has a positive influence on initial PSA usage. Results show that novelty seekers are more likely to try PSAs (by 1.416, if novelty seeking increases by one unit), compared to other consumers. Moreover, the strong support found for this factor indicates that new technologies may be tried if there is some additional arousal for the consumer. However, the results may also be driven by the fact that, because supermarket shopping is otherwise considered a necessary chore, a new technology available while shopping may provide added stimulation.

Moreover, market mavens seem to be more likely to try the PSA device compared to other consumers, with an odds-ratio of 1.278 (H_3). This result is especially important because prior

research had not explicitly linked market mavens and SST trial or use. From the standpoint of equity theory, the positive association between market mavenism and trial could be explained by the additional joy market mavens derive from being the first to use a new technology.

Hypothesis H₄ offered that trust in the retailer positively affects PSA trial. Results strongly confirm the important role of trust in stimulating initial PSA use since a one unit increase in trust would increase the likelihood of being a PSA user by 1.533. Given that prior studies on the use of SSTs had not explicitly explored the role of trust, this is an important finding.

Apart from the four hypothesized effects, several co-variables were included. Specifically, those variables hypothesized as antecedents of continuous PSA-usage were included and none of them showed a significant impact. The model also controlled for socio-demographics since earlier studies found some of these factors to impact technology trial or use. In the present sample, only age has a significant and negative impact on initial trial, indicating that younger shoppers are more likely to try the PSA device. This is in accordance with prior research findings that older consumers tend to be more critical of new services (Schmidt et al. 2012).

Assessing Antecedents of Continuous PSA-Usage

As argued earlier, the antecedents of initial trial are different from those impacting continuous use. It seems consumers must perceive continuous benefits from the technology to use it after their initial enthusiasm with it has worn off. To test the continuous use of PSA, the impact of three cost/benefit variables on the percentage of PSA-usage (Table 5) was assessed. To do so, a multiple regression including all PSA users ($n = 104$) was estimated. The overall model fit is acceptable ($F = 2.396$, $p = .004$; $R^2 = .297$; VIFs between 1.085 and 1.333).

---Table 5 about here---

H₅ suggested that consumers who perceived the PSA as easy to use would be more likely to actually use it since their perceived benefits are high despite the complexity of usage. Similar to other SST studies (e.g., Weijters et al. 2007), the present data finds support for this hypothesis.

Interestingly, perceived reduced waiting time does not seem to impact PSA use (H₆). This is surprising since it was hypothesized that quicker check-outs would be considered as a major benefit by consumers and therefore led to increased use of the PSA. However, it appears that PSAs would have to create benefits other than simply reduced waiting times. It is acknowledged that if more service-enhancing features are provided through the PSA, the greater would be the potential benefits of using the device.

As posited in H₇, results show that consumers' need for interaction negatively influences continuous PSA usage. This research proposed that consumers with a higher need for interaction use PSAs less often, as compared to other consumers. Possibly, these consumers prefer to interact with employees and other consumers and do therefore not want to (always) use a technological device that reduces such interactions.

As before, the model controlled for the antecedents of PSA-trial as well as socio-demographics. Interestingly, none of the antecedents of trial impact continuous use, underlining the contention that it takes different factors to stimulate initial trial of the new technology than to prompt a lasting behavioral change. Retailers must acknowledge this fact when trying to implement a new technology such as the PSA. While the newness of the technology might be sufficient to draw some attention leading to initial trial, additional benefits are needed to ensure that consumers adopt the technology.

As for socio-demographic variables, age is related to usage frequency, with younger consumers using the device more frequently. Data also shows that the higher a consumer's income, the higher their PSA-usage.

Assessing Retailer Benefits

To test whether PSA use offers benefits to the retailer, this study tracked PSA users through their loyalty card data. In the case of consumers not using the PSA, additional information on purchases was obtained through exit interviews and by collecting the receipts of their visit.

At first, findings show that the average sales receipt for the one comparable transaction during the study was significantly higher for PSA users as compared to non-users for that one visit (users: 50.39 Euros; non-users: 38.62 Euros; $t = 3.018$; $p < 0.01$). Thus, there appears to be support for the assumption that PSAs do offer retailers significant gains in terms of higher sales per transaction.

However, there might be an alternative explanation for these differences. It is possible that those who used the PSA would have spent more than non-users even if they had not adopted the PSA device. Thus, there may be a self-selection bias in the sense that consumers who tend to buy more per transaction are more likely to adopt PSA. If so, there must be significant differences in consumer characteristics between users and non-users prompting such differences in behavior. An appropriate method to detect whether the PSA device contributed to changes in behavior is propensity score matching (Heckman, Ichimura, and Todd 1997; Rosenbaum and Rubin 1984; Wangenheim and Bayon 2007). Essentially, a propensity score is the conditional probability of assignment to a particular treatment given a vector of observed covariates (Rosenbaum and Rubin 1983). This propensity score can help predict the effect of a treatment (e.g., PSA-usage)

on a group (e.g., the non-users) in the absence of the dependent variable (e.g., actual purchase behavior).

From a methodological point of view, PSA-usage can be seen as a “treatment” that some consumers are exposed to, while others are not. Since this research is interested in studying the effect of the “treatment” on actual purchase behavior, and there is no information on actual purchase behavior for one group (i.e., the non-users), propensity score matching assesses how the behavior of someone who has received the treatment would have developed had s/he not received the treatment. The matching method addresses this issue by creating a control group in which each treatment recipient is matched to one “similar” non-recipient, similar in terms of attitudinal antecedents of the treatment. Differences between treatment receivers and non-receivers can then be analyzed by comparing the two groups.

The process of propensity score matching was done as follows: First, the propensity score (of using the PSA) for both users and non-users was obtained through logistic regression with the suggested predictors of the conceptual model. The probability of the event occurring (i.e., PSA use) is given by the binary logistic regression model (odds) as a propensity score. This score can subsequently be used for matching users to “similar” non-users in such a way that the actual behavior of the user is matched to the nearest neighboring non-user. This procedure assumes that one can infer the behavior of the non-users by using the behavior of a PSA user who is similar in terms of their propensity scores.

Results of this propensity score matching procedure show that PSA users spent 52.18 Euros on average per store visit whereas non-users only purchase on average for 48.61 Euros. The difference in the average receipt is significant ($t = 2.949$; $p < .01$). This result offers further evidence that PSA users might offer economic benefits to retailers.

Further evidence of potential benefits from PSA users can be obtained by looking at sales patterns of PSA users over time. Figure 2a charts the average receipt of the PSA users and the average number of products in their basket during each visit for a period of 24 months. While the average receipt of PSA users increased substantially, the number of products purchased during a visit remains at a relatively stable level. Since there were no dramatic price increases during this period, one can only infer that PSA users tend to buy higher priced products, possibly aided by the additional information available through the PSA device.

This research also found additional insights on retailer benefits from PSA users by tracking their use beyond the empirical study of PSA users and non-users. In the 24 months of data available, the study found that the 500 consumers who were registered PSA users visited the store 8,271 times, bought approximately 250,000 different products, and spent a total of about 469,000 Euros during this time. The average ticket of approximately 57 Euros is similar to the figure found for the PSA users participating in this study. Moreover, the average ticket is significantly higher than the average of 38.62 Euros that was found by assessing the receipts collected from the sample of non-users, and also higher than the 48.61 Euros per average receipt when performing a propensity score matching. Thus, PSA use does appear to generate higher sales per visit – a clear, tangible, and unambiguous benefit for retailers.

---Figure 2 about here---

Overall, the conclusion is that PSA users are favorable to retailers and provide clear economic benefits. Thus, there is support for H_8 since users spend more per visit than non-users.

Follow-up Analysis on Continuous PSA-Usage

This research tracked the number of uses of the PSA each month by the registered PSA users for a 24 month period, and found that about 150 out of 500 consumers used the PSA at least once a month. However, during this period, there was also a steady decrease in PSA use (Figure 2b).

It is quite possible that there is a “flash-in-the-pan” effect of the PSA, driven by consumer attitudes, traits, or characteristics such as novelty-seeking, trust, low levels of technological anxiety, or market mavenism. Even consumers with a desire to interact with others during their shopping trip might still try the PSA. However, the device needs to deliver more tangible benefits, such as ease of use, for it to affect a change in consumers’ shopping behaviors.

DISCUSSION AND CONCLUSIONS

Findings and Implications for Management

This research has shown that consumer concerns about a new technology as well as their perceived benefits from the use of such technology are primary determinants of their readiness to continuously use a retailer-implemented innovation. More importantly, technology provides an important tool for conventional retailers to level the playing field with e-tailers. Technology-aided service innovations enable conventional retailers to create an information-rich store environment that may also contribute to enhanced and personalized service. The PSA is one such technological device that enables the retailer to provide greater information and service to the consumer.

In order to decide if investing in the PSA-technology will be beneficial for retailers, it has to be shown that there is value created for users of the innovation and that such enhanced value contributes to retailer profits. Findings reveal that PSA users are likely to spend more during a single shopping trip. However, it is unclear if investments in PSA technology can be recovered

even if users spend on average more than non-users. The following stylized example from the retailer on which this study has been based on provides initial evidence on the slow recovery of the investments.

At the time of this study, the retailer had implemented 15 PSA devices for a total cost of 50,000 Euros (30,000 Euros for hardware and roughly 20,000 Euros in software and various training programs). Findings from the propensity score matching revealed that PSA users spent on average 3.57 Euros more per shopping trip (given 52.18 Euros for users and 48.61 Euros for non-users). In order to recover that investment, with all other factors kept constant, it would take about 14,000 shopping trips of PSA users ($50,000 / 3.57 = 14,005.6$). Comparing that to the 24 months of actual purchase data, it can be noted that PSA users made only 8,271 shopping trips. Again assuming an extra 3.57 Euro per trip, these consumers accounted for an increase in sales of about 30,000 Euros (29,527.47 Euros, to be exact). Thus, it would likely take more time for the store to recover its initial investment.

Thus, in order to recover their investments in a service innovation, retailers must convince more consumers to try the innovation and also work harder to ensure that those who have tried become regular users. This is a particularly complex task, given that findings suggest that factors affecting initial trial are different from those of continuous use. Therefore, retailers must adopt different strategies for improving trial-rates as compared to enhancing continuous use of innovations. More specifically, this study finds trust towards the provider (retailer), novelty seeking, and market mavenism enhances consumer trial, while technology anxiety negatively affects the likelihood of trial. These findings imply that trial is predominantly driven by consumer attitudes (and traits), not all of which are easy for retailers to influence. At the minimum, retailers must build and leverage consumers' trust in them for encouraging trial.

When it comes to continuous use of the PSA, consumers' perceived ease of use enhances continuous use while their need for interaction with employees has negative impacts. From the presented findings, it is clear that consumers continue to use the innovation only if they see benefits. This may call for continued improvements to the features. In the present retail context, the usability and functionality of the PSA device needs continued scrutiny and improvement. However, given the long payback period even for recovering the initial investment, it is possible that some service innovations, such as the one described here, may not find further support unless there are drastic changes to the environment (e.g., consumers' preference for an enhanced in-store experience), technology (e.g., lower costs of adoption and deployment by the provider) and clear benefits (e.g., much needed consumer value and/or absence of other viable alternatives).

Limitations and Future Research

One primary limitation of this study remains the fact that it was conducted in just one retail outlet. Thus, it cannot be ruled out that the study results may be somewhat idiosyncratic to that specific retail outlet. However, the sampled retail store was from a competitive industry where most retail outlets are quite similar in their characteristics and business strategies. Also, a limitation is the fact that PSA as a technology is currently at a very early evolutionary stage and only a few retailers have implemented it. Despite the potential limits to generalizability, the choice of a single retail store and device enabled more rigorous testing. Studying the technology in actual use among actual consumers provided richer practical insights as compared to studies in simulated contexts. Moreover, study of the innovation in a single store enabled us to tap into a regular base of consumers as respondents and probably controlled for variations across different demographics of diverse trading areas.

Another disadvantage is the use of a convenience sample of PSA users and non-users through the intercept method. There may be some respondent bias caused by self-selection (Bush and Hair 1985), as well as interviewer bias. However, these may be of less consequence since the intent has not been on generalizing to the population but instead on obtaining rich insights on consumer and retailer benefits from a study of user and non-users.

Another limitation of this study is the lack of purchase history data for the group of non-users. This is an important limitation, since a rigorous test of differences in purchase behavior is only partially possible by matching the “most likely behavior” to non-users. Further research should therefore replicate this study using loyalty card transactions data for users as well as for non-users.

While the present study was conducted in a specific store setting, it is possible that consumers’ use of PSA could be impacted by other factors in other retail contexts. Possibly, PSA use might also be less beneficial for retailers of high-involvement products. Hence, future studies could be more comprehensive in taking a broad cut of different retail outlets in testing the antecedents to PSA use, as well as its consequent impacts for retailers.

Due to practical considerations, it was not feasible to capture the full spectrum of “usefulness” of the PSA device. Instead, the focus was on a few important aspects in a retail setting, including the reduction of “perceived waiting time.” While the findings cannot confirm PSA’s impact on perceived waiting time, future studies should consider a wide variety of perceived benefits of the PSA.

Moreover, the construct of enjoyment could be included to further investigate PSA usage. Consumers might still enjoy using a PSA long after the novelty has subsided. Therefore, one could speculate that enjoyment might lead to continuous use of PSA rather than initial trial – a

potentially relevant area which warrants further research. In addition, for a section of consumers who are high on shopping involvement, PSAs might lead to enhanced involvement and enjoyment of shopping approximating a situation characterized by ‘flow’, denoting an optimal experience (Csikszentmihalyi 1990). This too warrants further research.

Finally, further research might also include information on some shopping-trip specific variables, such as “purpose of the shopping trip.” This would allow further assessment of whether PSA use is beneficial for consumers under all circumstances, or whether it is only useful for specific occasions (e.g., the large weekend shopping).

Conclusion

Despite the above noted limitations, this study offers important new insights into consumer trial and adoption of service innovations in a retail context. While most studies on innovations focus on the positive impacts of the innovation, this research has provided some evidence that demonstrate that successful innovations must provide positive benefits as compared to costs to both users of the innovation as well as providers of the innovation. Specifically in the context of retailing, it may not be economically advantageous for every retailer to implement innovations, even if these have the potential to enhance shopping experience. For one, consumer trial of the service innovation depends, to a large extent, on the trust reposed on the retailer. Second, continued use depends, however, on vastly different factors, such as ease of use. Thus, providers may need to focus on innovations that are easier to use and also attract different segments of consumers. Finally, given the long payback and recovery periods, even for the initial investment, not all service providers may be interested in developing and implementing service innovations. However, all these factors, when consolidated, are only evidence of the fact that a service innovation could yield differential benefits and provide superior and inimitable competitive

advantages to savvy providers who understand and are able to influence the different factors contributing to consumer trial and continued use of the innovation.

REFERENCES

- Adams, J. Stacy. 1963. "Toward an understanding of inequity." *Journal of Abnormal and Social Psychology* 67 (5): 422-36.
- Ajzen, Izek. 1991. "The theory of planned behavior." *Organizational Behavior and Human Decision Processes* 50 (2): 179–211.
- Babin, Barry J, William R. Darden, and Mitch Griffin. 1994. "Work and/or fun: measuring hedonic and utilitarian shopping value." *Journal of Consumer Research* 20 (March): 644-656.
- Bahmanziari, Tammy, J. Michael Pearson, and Leon Crosby. 2003. "Is trust important in technology adoption? A policy capturing approach." *Journal of Computer Information Systems* 43 (4): 46-55.
- Barczak, Gloria. 2012. "The future of NPD/innovation research." *Journal of Product Innovation Management* 29 (3): 355-357.
- Bedington, Ed. 2002. "It's getting personal." *Grocer* June 1: 40.
- Berry, Leonard L., Kathleen Seiders and Dhruv Grewal. 2002. "Understanding service convenience." *Journal of Marketing* 66 (3): 1–17.
- Bhappu, Anita D., and Ulrike Schultze. 2006. "The role of relational and operational performance in business-to-business customers' adoption of self-service technology." *Journal of Service Research* 8 (4): 372-385.
- Bush, Alan J., and Joseph F. Hair. 1985. "An assessment of the mall intercept as a data collection method." *Journal of Marketing Research* 22 (2): 158-67.
- Chaudhuri, Arjun, and Morris B. Holbrook. 2001. "The chain effects from brand trust and brand affect to brand performance: the role of brand loyalty." *Journal of Marketing* 65 (2): 81-93.

- Childers, Terry L., Christopher L. Carr, Joann Peck, and Stephen Carson. 2001. "Hedonic and utilitarian motivations for online retail shopping behavior." *Journal of Retailing* 77: 511-35.
- Clark, Ronald A., and Ronald E. Goldsmith. 2005. "Market mavens: psychological influences." *Psychology and Marketing* 22 (4): 289-312.
- Curran, James M., and Matthew L. Meuter. 2007. "Encouraging existing customers to switch to self-service technologies: putting a little fun in their lives." *Journal of Marketing Theory and Practice* 15 (4), 283-299
- Curran, James M., and Matthew L. Meuter. 2005. "Self-service technology adoption: comparing three technologies." *Journal of Services Marketing* 19 (2): 103-13.
- Curran, James M., Matthew L. Meuter, and Carol F. Surprenant. 2003. "Intentions to use self-service technologies: a confluence of multiple attitudes." *Journal of Service Research* 5 (February): 209-24.
- Csikszentmihalyi, Mihaly. 1990. *Flow: The psychology of optimal experience*, New York: Harper and Row.
- Dabholkar, Pratibha A. 1996. "Consumer evaluations of new technology-based self-service options: an investigation of alternative models of service quality." *International Journal of Research in Marketing* 13 (1): 29-51.
- Dabholkar, Pratibha A., and Richard P. Bagozzi. 2002. "An attitudinal model of technology-based self-service: moderating effects of consumer traits and situational factors." *Journal of the Academy of Marketing Science* 30 (Summer): 184-201.
- Davis, Fred D. 1989. "Perceived usefulness, perceived use, and user acceptance of information technology." *MIS Quarterly* 13 (3): 319-40.

- Davis, Fred D., Richard P. Bagozzi, and Paul R. Warshaw. 1989. "User acceptance of computer technology: a comparison of two theoretical models." *Management Science* 35 (8): 982-1003.
- Donovan, Robert J., and John R. Rossiter. 1982. "Store atmosphere: an environmental psychology approach." *Journal of Retailing* 58 (1): 34-57.
- Donthu, Naveen. 2001. "Does your web site measure up?" *Marketing Management* 10 (4): 29-32.
- Economist*. 2009. Bleak Friday. November 28, 69-70.
- Eriksson, Karl, and Daniel Nilsson. 2007. "Determinants of the continued use of self-service technology: the case of internet banking." *Technovation* 27 (4): 159-167.
- Evanschitzky, Heiner, Gropalkrishnan R. Iyer, Josef Hesse, and Dieter Ahlert. 2004. "E-satisfaction: a re-examination." *Journal of Retailing* 80 (4): 239-47.
- Feick, Lawrence F., and Linda L. Price. 1987. "The market maven: a diffuser of marketplace information." *Journal of Marketing* 51 (1): 83-97.
- Fornell, Claes, and David F. Larcker. 1981. "Evaluating structural equation models with unobservable variables and measurement error." *Journal of Marketing Research* 18 (1): 39-50.
- Geissler, Gary, and Steve Edison. 2005. "Market mavens' attitudes towards general technology: implications for marketing communications." *Journal of Marketing Communications* 11 (2): 73-94.
- Grewal, Dhruv, Michael Levy, and V. Kumar. 2009. "Customer experience management in retailing." *Journal of Retailing* 85 (1): 1-14.

- Griffin, Abbie, and Albert L. Page. 1996. "PDMA success measurement project: recommended measures for product development success and failure." *Journal of Product Innovation Management* 13: 478-496.
- Hair, Joseph F., Rolph E. Anderson, Ronald L. Tatham, and William C. Black. 2006. *Multivariate data analysis, 5th edition*. Upper Saddle River, NJ: Prentice Hall.
- Heckman, James, Hidehiko Ichimura, and Petra E. Todd. 1997. "Matching as an econometric evaluation estimator: evidence from evaluating a job training programme." *Review of Economic Studies* 64 (4): 605–654.
- Hirschman, Elizabeth C. 1980. "Innovativeness, novelty seeking and consumer creativity." *Journal of Consumer Research* 7 (3): 283-96.
- Hung, Chia S., David C. Yen, and Chin S. Ou. 2012. "An empirical study of the relationship between a self-service technology investment and firm financial performance." *Journal of Engineering and Technology Management* 29 (1): 62-70.
- Jia, He M., Yonggui Wang, Lin Ge, Guicheng Shi, and Shanji Yao. 2012. "Asymmetric effects of regulatory focus on expected desirability and feasibility of embracing self-service technologies." *Psychology and Marketing* 29 (4): 209-225.
- Jarvenpaa, Sirkka L., and Peter A. Todd. 1997. "Is there a future for retailing on the internet?" Pp.139-154 in *Electronic marketing and the consumer*, edited by Robert A. Peterson, 139-154. Thousand Oaks, CA: Sage.
- Kourouthanassis, Panos E., and George Roussos. 2003. "Developing consumer-friendly pervasive retail systems." *IEEE Pervasive Computing* 2(2): 2-39.

Liljander, Veronica, Filippa Gillberg, Johanna Gummerus, and Allard van Riel. 2006.

“Technology readiness and the evaluation and adoption of self-service technologies.”

Journal of Retailing & Consumer Services 13 (3): 177-91.

Mehrabian, Albert and James A. Russel. 1974. *An approach to environmental psychology*.

Cambridge, MA: MIT Press.

Meuter, Matthew L, Amy L. Ostrom, Robert I. Roundtree, and Mary J. Bitner. 2000. “Self-

service technologies: understanding customer satisfaction with technology-based service encounters.” *Journal of Marketing* 64 (3): 50-64.

Meuter, Matthew L., Amy L. Ostrom, Mary J. Bitner, and Robert I. Roundtree. 2003. “The

influence of technology anxiety on consumer use and experiences with self-service technologies. *Journal of Business Research* 56: 899– 906.

Meuter, Matthew L., Mary J. Bitner, Amy L. Ostrom, and Stephen W. Brown. 2005. “Choosing

among alternative service delivery modes: an investigation of customer trial of self-service technologies.” *Journal of Marketing* 69: 61-83.

Noble, Steve, Amy G. Shenkan, and Christina Shi. 2009. “The promise of multichannel

retailing.” *McKinsey Quarterly* October.

Nunnally, Jum. C. 1978. *Psychometric theory, 2nd edition*. New York: McGraw-Hill.

Oyedele, Adesegun and Penny M. Simpson. 2007. “An empirical investigation of consumer

control factors on intention to use selected self-service technologies.” *International Journal of Service Industry Management* 18 (3): 287-306.

Parasuraman, A. 2000. “Technology Readiness Index (TRI): A multiple-item scale to measure

readiness to embrace new technologies.” *Journal of Service Research* 2 (4): 307-21.

- Pemberton, James. 2004. "Personal shopping assistant finds favour in German retail market." *European Retail Digest* 43 (Autumn 2004): 34-37.
- Puccinelli, Nancy M., Ronald C. Goodstein, Dhruv Grewal, Robert Price, Priya Raghubir, and David Stewart. 2009. "Customer experience management in retailing: understanding the buying process." *Journal of Retailing* 85 (1): 15-30.
- Raub, Annalyse C. 1981. "Correlates of computer anxiety in college students." Unpublished Ph.D. Thesis, University of Pennsylvania.
- Rogers, Everett M. 2003. *Diffusion of innovations*, 5th edition. New York: Free Press.
- Rosenbaum, Paul R., and Donald J. Rubin. 1983. "The central role of the propensity score in observational studies for causal effects." *Biometrika* 70 (1): 41-55.
- Schleimer, Stefanie C., and Arthur D. Shulman. 2011. "A comparison of new service versus new product development:" Configurations of collaborative intensity as predictors of performance. *Journal of Product Innovation Management* 28 (4): 521-535.
- Schmidt, Jeff B., Linda T. Zayer, and Roger J. Calantone. 2012. "Grumpier old men: Age and sex differences in the evaluation of new services." *Journal of Product Innovation Management* 29 (1): 88-99.
- Sethuraman, Raj, and A. Parasuraman. 2005. "Succeeding in the big middle through technology." *Journal of Retailing* 81(2): 107-111.
- van Riel, Allard. C. R., Joos Lemmink, and Hans Ouwersloot. 2004. "High-technology service innovation success: a decision-making perspective." *Journal of Product Innovation Management* 21: 348-359.
- Wang, Michael Chih-Hung. 2012. "Determinants and consequences of consumer satisfaction with self-service technology in a retail setting." *Managing Service Quality* 22 (2): 128-144.

- Wang, Liz. C., Julie Baker, Judy A. Wagner, and Kirk Wakefield. 2007. "Can a web site be social?" *Journal of Marketing* 71 (July): 143-157.
- Wang, Cheng, Jennifer Harris, and Paul G. Patterson. 2012. "Customer choice of self-service technology: the roles of situational influences and past experience." *Journal of Service Management* 23 (1): 54-78.
- v. Wangenheim, Florian, and Tomás Bayón. 2007. "Behavioral consequences of overbooking service capacity." *Journal of Marketing* 71 (4): 36-47.
- Weijters, Bert., Devarajan Rangarajan, Tomas Falk, and Niels Schillewaert. 2007. "Determinants and outcomes of customers' use of self-service technology in a retail setting." *Journal of Service Research* 10 (1): 3-21.
- Westjohn, Stanford. A., Mark J. Arnold, Peter Magnusson, Srdan Zdravkovic, and Joyce X. Zhou. 2009. "Technology readiness and usage: A global-identity perspective." *Journal of the Academy of Marketing Science* 37 (3): 250-265.
- Wood, Stacy. L., and C. Page Moreau. 2006. "From fear to loathing? how emotion influences the evaluation and early use of innovations." *Journal of Marketing* 70 (3): 44-57.
- Wooder, Stella, and Steven Baker. 2011. "Extracting key lessons in service innovation." *Journal of Product Innovation Management* 29 (1): 13-20.

Figure 1
Conceptual Framework

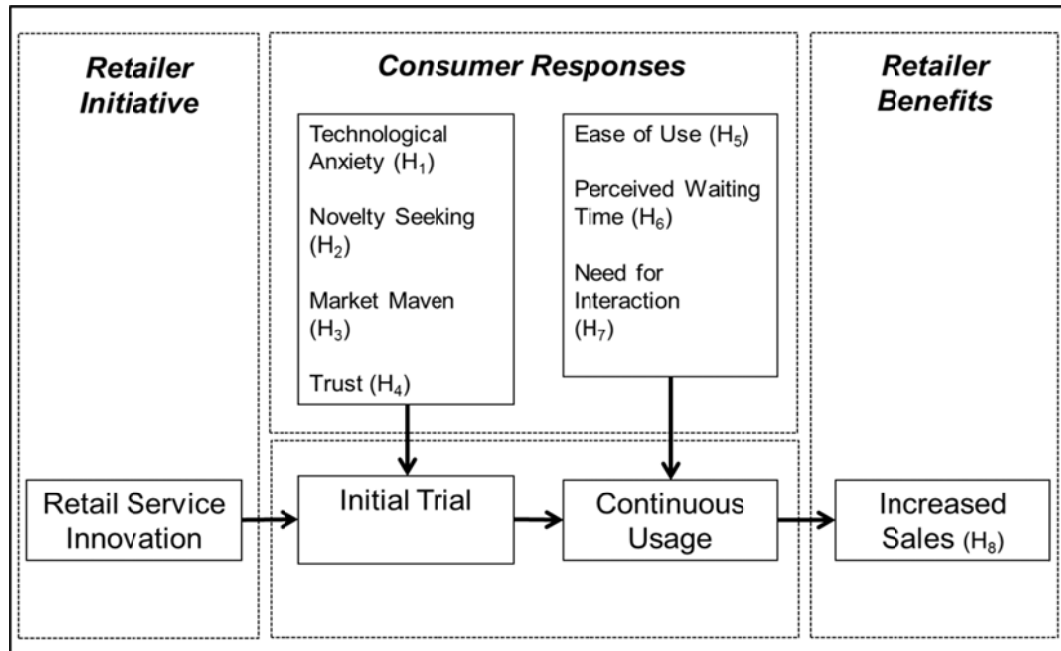


Figure 2
(a) Sales per Visit and Products Purchased per Visit for PSA Users
(b) Monthly Transactions of PSA Users

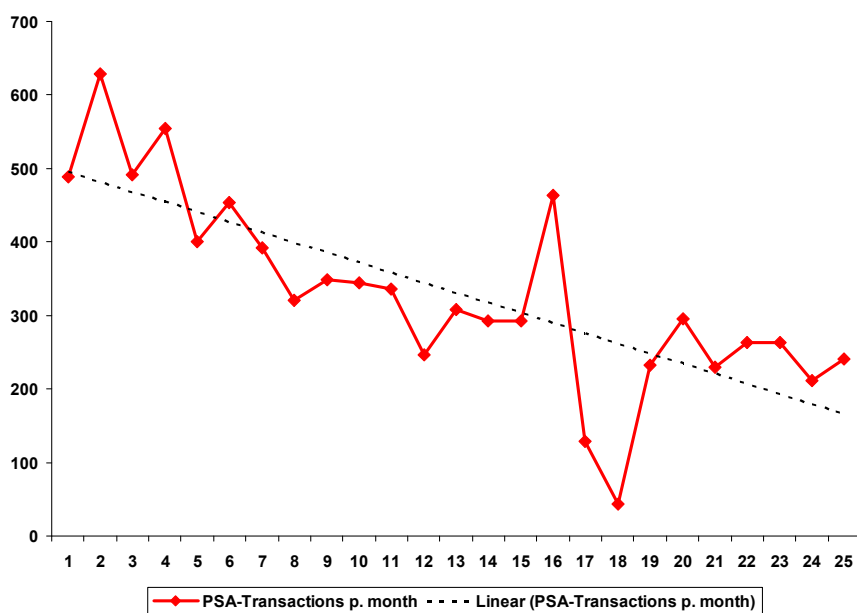
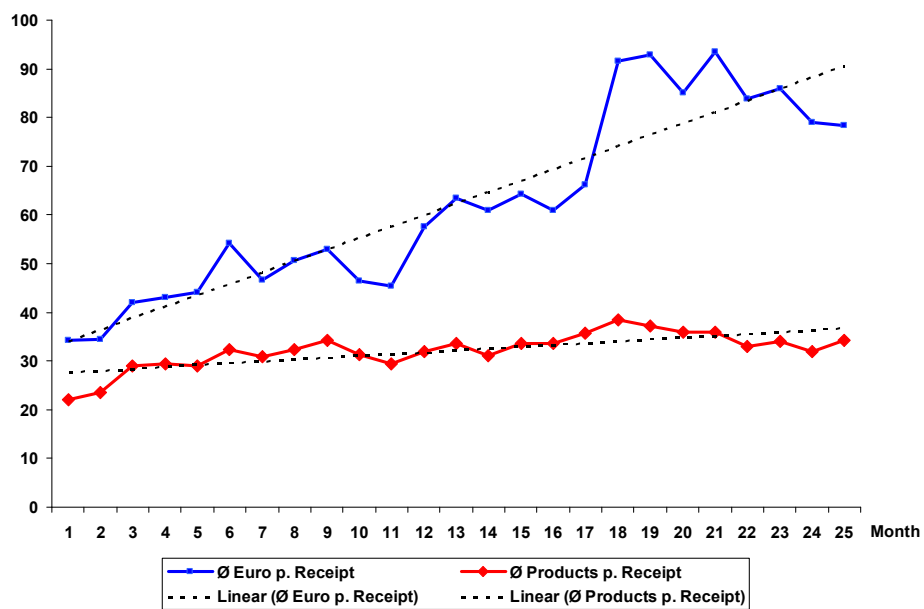


Table 1
Sample Characteristics

	Overall (n=449)	User (n=104)	Non-User (n=345)
Gender (% female)	51.2	40.4	54.5
Age (mean, s.d.)	41.7 (14.5)	37.3 (12.3)	43.0 (14.8)
Education (% more than graduation)	39.4	39.7	39.2
Marital status (% married)	49.9	59.0	47.2
Monthly net income in Euros (mean, s.d.)	2,950 (1,007)	3,170 (890)	2,890 (1,032)
<i>Profession (% of Sample)</i>			
Self-employed	12.6	9.9	13.3
White-collar employee	57.0	68.3	53.6
Blue-collar employee	4.0	6.9	3.2
College student	6.7	5.9	7.0
Retiree	14.6	5.0	17.4
Others	5.1	4.0	5.5

Table 2
Measurement Scales and Sample Items

	Mean	SD	Factor Loadings	Alpha	CR	AVE
<i>Technological Anxiety</i>						
Trouble with technology	1.52	1.36	.708	.765	.876	.540
Afraid of making mistakes	2.10	1.99	.725			
Worry to destroy something	1.57	1.54	.736			
Need to learn usage	1.17	0.86	.721			
Feeling of being up-to-date (+)	6.29	1.51	.803			
General fear of technology	1.35	1.20	.713			
<i>Novelty Seeking</i>						
Searching for new things	5.70	1.85	.698	.749	.815	.524
Board by new things	4.46	2.36	.689			
Like new things	5.96	1.59	.768			
Enjoy daily new things	5.85	1.66	.738			
<i>Market Maven</i>						
Like introducing new products	3.41	2.42	.686	.834	.876	.503
Like providing information	3.46	2.34	.672			
Asked frequently	3.33	2.39	.687			
Know best products	4.98	2.19	.686			
Information source	3.77	2.23	.787			
Describing	4.01	2.04	.671			
Knowledge of products	4.09	2.30	.767			
<i>Trust</i>						
Trustworthy	6.35	1.31	.768	.789	.840	.514
Honest	6.37	1.24	.777			
Believe it	5.97	1.49	.689			
Low risk	6.58	0.97	.681			
Friendly	6.42	1.15	.661			
<i>Need for Interaction</i>						
Humans make interaction enjoyable	6.00	1.60	.718	.701	.740	.487
Like interacting with provider	6.17	1.44	.638			
Bothered using a machine	4.77	2.37	.734			
<i>Ease of Use</i>						
Complicated ... easy	6.19	1.68	.719	.755	.772	.530
Takes a lot of effort ... takes no effort	5.75	2.03	.732			
Is confusing ... not at all confusing	6.37	1.44	.732			
<i>Perceived Waiting time</i>						
Check-out quicker with PSA	6.31	1.58	n.a.	n.a.	n.a.	n.a.

Model fit: Chi-Square/D.F. = 1.877; CLI = .950; TLI = .937; RMSEA = .044; SRMR = .044

Table 3
Correlation Matrix and Test of Discriminant Validity

Technological anxiety	(.540)						
Need for interaction	.142**	(.487)					
Ease of use	-.218**	-.080	(.530)				
Trust	.069	.146**	.127*	(.514)			
Perceived waiting time	.005	-.030	.334**	.139**	(<i>n.a.</i>)		
Market maven	-.008	.100*	.108*	.142**	.021	(.503)	
Novelty seeking	-.175**	.056	.143**	.005	.011	.274**	(.524)

* significant at .1-level

** significant at .05-level

Values in parentheses: Average Variance Extracted (AVE)

Table 4
Logistic Regression Results

Dependent variable: PSA Usage [Yes/No]

Factor	Beta	Error	WALD	Sig.	Hypothesis
<i>Antecedents of Initial Trial</i>					
Technological anxiety	-.322	.146	3.880	.049	H ₁ : supported
Novelty seeking	.348	.135	7.577	.007	H ₂ : supported
Market-maven	.245	.127	3.864	.049	H ₃ : supported
Trust	.427	.149	9.345	.002	H ₄ : supported
<i>Co-Variables</i>					
<i>Antecedents of continuous use</i>					
Need for interaction	-.211	.121	3.085	.079	
Ease of use	.295	.130	3.280	.070	
Perceived waiting time	.008	.137	.004	.951	
<i>Socio-demographics</i>					
Gender	.614	.279	3.085	.079	
Age	-.034	.013	7.139	.008	
Education	.068	.135	.255	.614	
Profession	.033	.093	.124	.725	
marital status	.301	.224	1.810	.178	
Income	.157	.162	2.706	.100	

-2 log likelihood: 345.152

Cox & Snell R²: .196

Nagelkerke R²: .256

Hosmer and Lemeshow Test: Chi-square (df) = 10.853 (8), p<.210

Table 5
Multiple Regression Results

Dependent variable: Continuous PSA Usage [% of all shopping trips]

	Beta	t-value	Sig.	Hypothesis
<i>Antecedents of continuous use</i>				
Ease of use	.224	2.136	.035	H ₅ : supported
Perceived waiting time	.107	1.087	.280	H ₆ : not supported
Need for interaction	-.210	-1.993	.048	H ₇ : supported
<i>Co-Variables</i>				
<i>Antecedents of initial trial</i>				
Technological anxiety	-.008	-.079	.937	
Market-maven	.091	.835	.406	
Novelty seeking	.020	.182	.856	
Trust	.029	.255	.799	
<i>Socio-demographics</i>				
Gender	.089	1.604	.110	
Age	-.138	-2.242	.026	
Education	-.010	-.171	.865	
Profession	-.008	-.146	.884	
marital status	-.052	-.912	.362	
Income	.126	2.068	.039	

F = 2.396 (p=.004)

R²: .297

Variance inflation factors (VIFs) between 1.085 and 1,333